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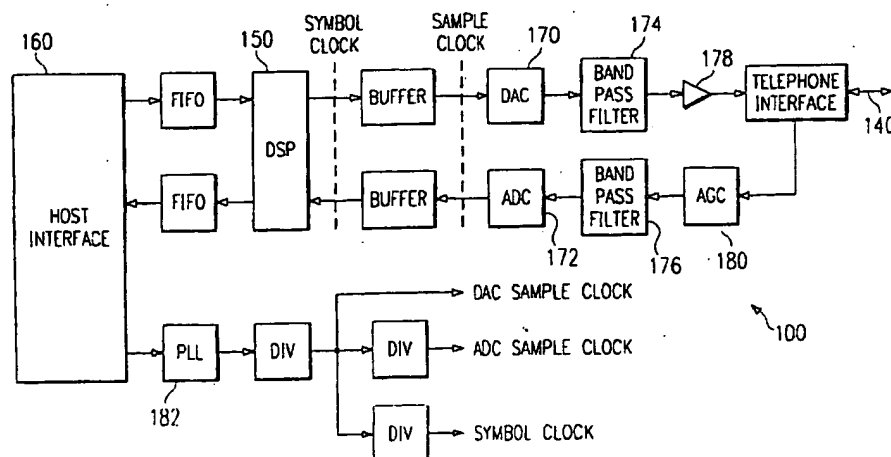
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### (54) Multimode modem, and protocols therefor

(57) A modem is provided, which can operate either in voiceband or in higher frequency bands, and which supports several modulation types, such as multicarrier modulation, or carrierless amplitude/phase modulation. The modem uses a digital signal processor, so that different ADSL modulation types can be implemented using the same hardware. Startup and negotiation procedures are also provided. The startup for carrierless am-

plitude/phase modulation allows reliable synchronisation over channels, such as the standard telephone twisted pair lines, which suffer from severe amplitude distortion. In a multicarrier system, the transmitter contains a filter, which is adapted to reduce the effective length of the channel impulse response; the filter uses a combination of convolution in the time domain, and multiplication in the frequency domain, so as to reduce the algorithmic complexity.

FIG. 1b



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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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